

# **Opportunities in Reactor and Fuel Cycle Technologies**

**Presentation of**

**Marvin Resnikoff, Ph.D.  
Radioactive Waste Management Associates**

**Before the  
Blue Ribbon Commission  
on America's Nuclear Future  
Reactor and Fuel Cycle Technology Subcommittee**

**Washington, D.C.  
30 August 2010**

# West Valley Euphoria

At the ground-breaking for the new facility, Governor Nelson Rockefeller proclaimed, this industry would "make a major contribution toward transforming the economy ...of the entire state."

# Is Reprocessing a Waste Management Solution?

---

In terms of volume, heat and toxicity, reprocessing does little to reduce the repository burden.

# Volume Reduction?

To chemically separate Pu, U and fission products, chemicals must be added. To solidify liquid waste, glass frit must be added to make borosilicate glass. The fuel cladding and depleted U are waste materials; low-level waste is generated as well.

# Repository Size

The spacing of waste in a repository is a function of the initial heat production or power per acre, primarily a function of the Cesium and Strontium. Pu-recycle does not change this factor.

# Waste Toxicity

- A Pu-recycle program uses 1/3 MOX fuel and 2/3 U fuel.
- The continual recycling of Pu in MOX fuel leads to the buildup of greater amounts of americium, curium and higher isotopes of plutonium.

# U recycle?

- U is not recycled. It has lower U-235 content than natural U and U-236, a neutron poison.
- “Burning” Np and actinides in an LWR similarly requires higher enrichment to compensate.

# Advanced Fuel Cycle

To separate Am, Cm and Np, and separately “burn” these actinides, the PUREX process must be altered, and a fleet of fast, plentiful neutron reactors must be developed.

Some fission products are toxic for long periods of time: C-14, Cl-36, Tc-99 and I-129, and are not simple to restrain at a reprocessing plant.



# Conclusion

- Because of past experience and the economics, commercial reprocessing will not be possible except as a government bailout.
- It has been 35 years of Pu-recycle and transmutation funding and it is still a laboratory experiment; the BRC should recommend that government funding for this program cease.